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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b)

Attorney Docket No. 42390.P6280 Total Pages 2

First Named Inventor or Application Identifier Jeffery L. Schiffer

Express Mail Label No. EL164804873US

ADDRESS TO: **Assistant Commissioner for Patents**
Box Patent Application
Washington, D. C. 20231

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [X] Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)

2. [X] Specification (Total Pages 18)
(preferred arrangement set forth below)
- Descriptive Title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description
- Claims
- Abstract of the Disclosure

3. [X] Drawings(s) (35 USC 113) (Total Sheets 5)

4. [X] Oath or Declaration (Total Pages 6)
   a. [ ] Newly Executed (Original or Copy)
   b. [ ] Copy from a Prior Application (37 CFR 1.63(d))
   (for Continuation/Divisional with Box 17 completed) **(Note Box 5 below)**
   i. [ ] DELETIONS OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).

5. [ ] Incorporation By Reference (useable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. [ ] Microfiche Computer Program (Appendix)

7. [ ] Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
   a. [ ] Computer Readable Copy
   b. [ ] Paper Copy (identical to computer copy)
   c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. _X_ Assignment Papers (cover sheet & documents(s))
9. ____ a. 37 CFR 3.73(b) Statement (where there is an assignee)
   ____ b. Power of Attorney
10. ____ English Translation Document (if applicable)
11. _ a. Information Disclosure Statement (IDS)/PTO-1449
    _ b. Copies of IDS Citations
12. _ Preliminary Amendment
13. _X_ Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
14. _ a. Small Entity Statement(s)
    b. Statement filed in prior application, Status still proper and desired
15. _ Certified Copy of Priority Document(s) (if foreign priority is claimed)
16. _ Other: ____

17. **If a CONTINUING APPLICATION,** check appropriate box and supply the requisite information:
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42390.P6280 *PATENT*

UNITED STATES PATENT APPLICATION

for

A METHOD AND APPARATUS FOR INTEGRATING AN INTENTIONAL RADIATOR IN A SYSTEM

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A METHOD AND APPARATUS FOR INTEGRATING AN INTENTIONAL RADIATOR IN A SYSTEM

FIELD OF THE INVENTION

The present invention relates generally to an intentional radiator, and more particularly, to integration of an intentional radiator in a system.

BACKGROUND OF THE INVENTION

In order to limit unwanted device emissions to meet Federal Communications Commission (FCC) standards, manufacturers of computer systems, and other types of devices that produce unwanted emissions, use some type of shielding. For a mobile computer system, for example, a metalized layer may be used inside a plastic housing to provide shielding. Metal-impregnated plastic, metallic paint, and/or a metal housing provide other examples of types of shielding for various applications.

Whatever shielding approach is used, the integrity of the shielding is a factor in determining whether the system or device that uses the shielding meets FCC standards for limiting unwanted emissions (set forth in 47 C.F.R. § 15).

An issue may therefore arise where a system, for example, uses shielding to reduce unwanted emissions, but it is desirable to integrate a radio frequency (RF) module, or other intentional radiator, within such a system. If the intentional radiator is enclosed within the shielding, the shielding will interfere with the operation of the intentional radiator.

Alternatively, an opening provided in the shielding to enable the intentional radiator to operate can allow unwanted device emissions radiated through the opening to rise to an unacceptable level.

One approach to addressing this issue is to provide an antenna for the intentional radiator on a computer card, such as a Personal Computer Memory Card International Association (PCMCIA) card. The antenna then extends outside a computer system beyond the shielding. For another approach, a unique type of connector is connected to a cable that connects to an external antenna. For some such approaches, the cable may need to be long.

Each of the above approaches, while providing for an antenna outside system shielding, has a drawback. The above approaches are not easily applied to, for example, an integrated intentional radiator module. An integrated intentional radiator module, as the term is used herein, refers to a module that may be certified as an intentional radiator in and of itself. Such a module may include an integrated antenna, or one that is coupled to the module by a fixed length of cable. Such a module may also include components that radiate unwanted emissions, and thus, should be shielded.

SUMMARY OF THE INVENTION

A method and apparatus for integrating an intentional radiator in a system are described.

For one embodiment, an apparatus comprises an intentional radiator including an antenna and a ground plane, wherein the ground plane is to be coupled to shielding that includes an opening for the antenna. The intentional radiator is to be positioned such that the antenna radiates through the opening, while the shielding and the ground plane reduce emissions through the opening.

Other features and advantages of various embodiments will be apparent from the accompanying drawings and from the detailed description that follows below.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example and not limitation in the figures of the accompanying drawings, in which like references indicate similar elements, and in which:

Figure 1 shows a cross-section of a system according to one embodiment that includes an integrated intentional radiator and one or more shielding connections.

Figure 2 shows a cross-section of a system that includes an integrated intentional radiator of another embodiment wherein a ground plane is coupled directly to system shielding.

Figure 3 shows a cross-section of a system that includes an integrated intentional radiator of yet another embodiment wherein a ground plane is coupled to system shielding by vias in a first P.C. board layer.

Figure 4 is a top view of the intentional radiator of Figure 3.

Figure 5 shows a cross-section of an integrated intentional radiator of another embodiment wherein a ground plane is coupled to system shielding by vias in a different P.C. board layer.

Figure 6 is a top view of the intentional radiator of Figure 5.

Figure 7 is a flow diagram showing the method of one embodiment for integrating an intentional radiator module in a system.

DETAILED DESCRIPTION

A method and apparatus for integrating an intentional radiator in a system is described. Although the following embodiments are described with reference to a notebook computer system including an integrated radio frequency (RF) module, alternative embodiments are applicable to other types of systems that may benefit from the integration of an integrated RF module or another type of intentional radiator. Examples of such systems include, but are not limited to, cellular telephones, digital cameras and other types of mobile devices, such as laptops or personal digital assistants (PDAs).

For one embodiment, an intentional radiator includes an antenna and a ground plane wherein the ground plane is coupled to shielding that includes an opening for the antenna. The intentional radiator is positioned such that the antenna radiates through the opening while the ground plane and shielding together reduce the level of emissions through the opening.

Figure 1 is a cross-sectional view of a portion of a system 100. The system 100 is a notebook system in this example. The system 100 includes a skin 105 or other type of housing, shielding 110, and an integrated radio frequency (RF) module or other type of intentional radiator 115.

The notebook skin 105 may be formed of a plastic, for example, but other types of material are within the scope of various embodiments. In Figure 1, the notebook skin 105 is only shown as extending across one side of the system 100. For other embodiments, the skin 105 may extend around multiple surfaces of the system 100 or may not be included.

The shielding 110 is provided to shield devices within the system 100 that produce unwanted emissions. For one embodiment, the shielding 110 comprises metallic paint or another type of metallic coating that is applied to an inner surface of the notebook skin 105. For another embodiment, the shielding 110 is formed of a metallic material that is fitted within the notebook skin 105. For yet another embodiment, the notebook skin 105 is formed of a metal or a metal-impregnated material such that the shielding is integral to the notebook skin 105 itself. Other types of shielding are also within the scope of various embodiments.

The intentional radiator module 115 of one embodiment is an integrated RF module that can be certified as a radiator on its own, outside of the system 100. The integrated intentional radiator module 115 includes components 120 and 121 connected to one side of a multi-layer printed circuit (P.C.) board 125. For one embodiment, one or both of the components 120 and/or 121 may produce unwanted emissions such that it is desirable to limit the level of such emissions that can be measured outside the notebook skin 105, for example.

The intentional radiator module 115 may include other devices not shown in Figure 1 and/or may not include the components 120 and/or 121. Further, the system 100 may include other devices to be shielded that are not shown in Figure 1. Such other devices are provided within the shielding 110.

For the example shown in Figure 1, the multi-layer P.C. board 125 includes three layers 126-128, however, a different number of layers may be used for other embodiments. In Figure 1, traces 130 are provided between the

first and second layers 126 and 127, respectively, of the P.C. board 125 to interconnect the devices 120 and 121 and/or other devices (not shown). The traces may be formed of copper or another conductive material. Vias (not shown) may be provided to couple the traces 130 and/or the ground plane 135 to the components 120 and/or 121.

A ground plane 135 is provided between the second and third layers of the P.C. board, 127 and 128, respectively. The ground plane 135 may also be formed of copper or another conductive material and provides a ground for the components 120 and 121 and/or other components on the R.F. module 115.

An antenna 140 is provided on a side of the P.C. board 125 opposite from the components 120 and 121, and may be patterned or soldered onto the P.C. board 125. The antenna 140 radiates and receives signals from and to the intentional radiator module 115. The ground plane 135 also provides a ground for the antenna 140. Because of the fixed spatial relationship between the antenna 140 and the ground plane 135 for the embodiment shown in Figure 1, the characteristics of the antenna 140 are well defined regardless of whether or not the module 115 is integrated in the system 100.

For another embodiment, the antenna 140 is a discrete antenna that is coupled to the P.C. board 125 by a short, fixed length cable (not shown). The antenna is coupled to other parts of the module 115 by one or more vias 145 through one or more of the P.C. board layers 126-128.

The shielding 110 includes an opening 150. For one embodiment, the opening 150 in the shielding 110 is larger in size and shape than the antenna

150, but not excessively large. Where the shielding is a metallic paint or coating, the opening 150 may be patterned in the shielding, for example. Where the shielding is another type of metallic layer, the opening 150 may be cut or punched from the shielding, or formed in another manner.

As discussed in the Background section, an opening in the shielding may allow undesirable levels of unwanted emissions to be measured outside of the system 100. For one embodiment, to reduce the level of unwanted emissions that radiate through the opening 150, one or more shielding connection(s) 155 is provided. The shielding connection(s) couple the shielding 110 to the ground plane 135 of the integrated RF module 115.

For one embodiment, the shielding connection(s) 155 extend around the entire opening 150 such that the ground plane, shielding connection(s) 155 and the shielding 110 form a continuous shield against unwanted emissions from components 120, 121 and/or other devices in the system 100 (not shown).

For another embodiment, the shielding connection(s) 155 is coupled to one or more sides of the ground plane 135 to reduce the level of emissions that are radiated through the opening 150, but does not necessarily extend around the entire perimeter of the ground plane 135. While there may still effectively be an opening in the shielding for some embodiments, the level of emissions radiated through the opening 150 is lower than it would be where a ground plane is not positioned below the opening and/or a shielding connection is not used.

The shielding connection(s) 155 of one embodiment are formed of a flexible copper tape that is soldered to the ground plane 135 and the shielding

110. The flexible copper tape may extend around the entire perimeter of the ground plane such that the opening 150 is effectively sealed from a shielding point of view. For another embodiment, one or more strips of flexible copper tape may be soldered or connected to the shielding 110 and the ground plane 135 in another manner at one or more locations around the perimeter of the ground plane 135.

The shielding connection(s) of another embodiment comprise one or more metal bars or another type of metallic member that is mechanically coupled to the shielding 110 and the ground plane 135 by screws or another fastening member. Similar to the copper tape, the metal members(s) may be placed around the entire perimeter of the ground plane 135. Alternatively, one or more of the metal members may be placed at one or more locations around the perimeter.

The number and placement of shielding connection(s) and/or their spacing around the perimeter of the ground plane 135 may depend on several factors including, for example, the particular FCC requirements for unwanted emissions levels for the system 100 and the materials used to provide the shielding connection(s).

For yet another embodiment, the ground plane 135 may be formed such that discrete shielding connection(s) may not need to be provided. An example of such an embodiment is shown in **Figure 2**.

As shown in **Figure 2**, the P.C. board layer 128 of the intentional radiator module 215 extends beyond the perimeter of the P.C. board layers 126 and 127

on one or more sides. The ground plane 135 is provided on the side of the P.C. board layer 128 that interfaces with the P.C. board layer 127. In this manner, the ground plane 135 can be directly coupled to the shielding 110 on one or more sides of the intentional radiator module 215 to close, or partially close the opening 150 to unwanted emissions. This direct coupling may be accomplished through soldering or another approach.

For another embodiment, as shown in **Figures 3 and 4**, one or more additional vias 310 may be provided between the ground plane 135 and a surface of an intentional radiator module 315. The intentional radiator module 315 may then be coupled to the shielding with screws or other mechanical connectors, or the intentional radiator module 315 may be soldered to the shielding 110 or connected in another manner. In this manner, the ground plane 135 is coupled to the shielding 110 to reduce unwanted emissions through the opening 150.

Figure 4 is an overhead view of the intentional radiator module 315. While Figure 4 shows vias 310 in a particular pattern around the perimeter of the P.C. board layer 128, any number of vias 310 may be provided in a different arrangement on the intentional radiator module 315. For example, the vias 310 may be placed immediately around the antenna 140. Further, while a particular shape is shown for the antenna 140, the antenna may be a different shape for other embodiments.

Figures 5 and 6 show an intentional radiator module 515 of another embodiment that is coupled to the shielding 110 in a similar manner to the

embodiments shown in Figures 3 and 4. For the embodiments shown in Figures 5 and 6, however, one or more additional vias 525 extend through the P.C. board layers 127 and 126 to provide connections to the ground plane 135 on a surface of the P.C. board layer 126. In this manner, the intentional radiator module 515 may be directly coupled to the shielding 110 in the manner shown to reduce emissions through the opening 150.

Figure 6 is an overhead view of the P.C. board layer 126 with one possible pattern for the vias 525. It will be appreciated that the vias 525 may be provided in any pattern to couple the ground plane 135 to the shielding 110.

While various examples of shielding connections and approaches to coupling the shielding and radiator ground plane have been described above, it will be appreciated that other types of shielding connection(s) 155 and/or other connection approaches may be used in accordance with various embodiments. Further, while specific details of an integrated RF module have been described, other types of intentional radiators that do not include a P.C. board, or that include a P.C. board configured in another manner, for example, are also within the scope of various embodiments.

In accordance with the above-described embodiments, an integrated intentional radiator module can be integrated into a system while still providing effective shielding to maintain unwanted emissions at an acceptable level. Further, the ground plane of the intentional radiator module itself is used to provide part of this shielding where an opening in the conventional shielding is provided for an antenna. In this manner, the ground plane can be used to serve

multiple purposes without adding significant additional materials or cost to the system.

Also, where shielding is provided separately from a system skin or housing, it is not necessary to provide a hole in the housing in order to enable the intentional radiator to radiate. By providing the antenna as part of an integrated module that includes a ground plane used to effectively close an opening in shielding through which an antenna radiates, a separate opening in the skin is not needed.

Figure 7 is a flow diagram showing the method of one embodiment for integrating an intentional radiator into a system. At block 705, a ground plane of an intentional radiator module is coupled to shielding of the system in which the module is to be integrated. The system shielding includes an opening for an antenna on the intentional radiator module. For one embodiment, one or more connections are soldered between the ground plane and the shielding to couple the ground plane and the shielding. For another embodiment, the ground plane and shielding are mechanically coupled.

At block 710, the antenna is positioned proximate to the opening in the system shielding such that the antenna radiates through the opening. In the above manner, devices within an enclosure defined by the shielding and the ground plane are shielded to reduce unwanted emissions through the opening.

It will be appreciated that, for other embodiments, the method may not include all of the steps shown in Figure 7 or may include steps not shown in Figure 7.

In the foregoing specification, the invention has been described with reference to specific exemplary embodiments thereof. It will, however be appreciated that various modifications and changes may be made thereto without departing from the broader spirit and scope of the invention as set forth in the appended claims. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

CLAIMS

What is claimed is:

1. An apparatus comprising:

an intentional radiator including an antenna and a ground plane, the ground plane to be coupled to shielding that includes an opening for the antenna, the intentional radiator to be positioned such that the antenna radiates through the opening and the shielding and the ground plane reduce emissions through the opening.

2. The apparatus of claim 1 further comprising a shielding connection to couple the ground plane to the shielding.

3. The apparatus of claim 1 wherein the intentional radiator comprises a printed circuit board, the antenna being disposed on a first layer of the printed circuit board, the ground plane being disposed on a second layer of the printed circuit board.

4. An apparatus comprising:

an intentional radiator including an antenna and a ground plane; and

shielding including an opening, the antenna to radiate through the opening, the shielding being coupled to the ground plane, the ground plane to reduce emissions through the opening.

5. The apparatus of claim 4 wherein the intentional radiator comprises a multi-layer printed circuit board, the antenna being disposed on a first layer of the printed circuit board, the ground plane being disposed on a second layer of the integrated circuit board.

6. The apparatus of claim 4 further including a skin covering the opening.

7. The apparatus of claim 4 further including a shielding connection to couple the shielding to the ground plane.

8. The apparatus of claim 4 wherein the intentional radiator comprises a radio frequency module.

9. A system comprising:

a device to be shielded;

an intentional radiator including an antenna and a ground plane;

shielding enclosing the device to be shielded except for an opening proximate to the antenna, the shielding being coupled to the ground plane to reduce emissions through the opening by the device to be shielded.

10. The system of claim 9 further including a skin covering the opening.

11. The system of claim 9 wherein the device to be shielded is integrated with the intentional radiator.

12. The system of claim 9 wherein the intentional radiator includes a printed circuit board and wherein the antenna is included on a first layer of the printed circuit board and the ground plane is included on a second layer of the printed circuit board.

13. The system of claim 9 wherein the intentional radiator comprises a radio frequency module.

14. A method for integrating an intentional radiator in a system, the method comprising:

coupling a ground plane of an intentional radiator to system shielding that includes an opening for an antenna coupled to the intentional radiator.

15. The method of claim 14 further including positioning the antenna to radiate through the opening.

16. The method of claim 14 wherein coupling the ground plane to the system shielding includes soldering a connection between the ground plane and the system shielding.

17. The method of claim 14 wherein coupling the ground plane to the system shielding includes mechanically connecting the ground plane and the system shielding.

18. An apparatus comprising:

a means for shielding including an opening for an antenna; and

a means for coupling the shielding to a ground plane of an intentional radiator including the antenna, the ground plane and the means for coupling to reduce emissions through the opening.

19. The apparatus of claim 18 wherein the means for shielding comprises one of a metallic paint or a metal enclosure.

20. The apparatus of claim 18 wherein the means for coupling comprises one of mechanical connector or a soldered connection between the intentional radiator and the means for shielding.

ABSTRACT

An intentional radiator includes an antenna and a ground plane. The ground plane is to be coupled to shielding that includes an opening for the antenna wherein the intentional radiator is to be positioned such that the antenna radiates through the opening. The shielding and the ground plane together act to reduce emissions through the opening.

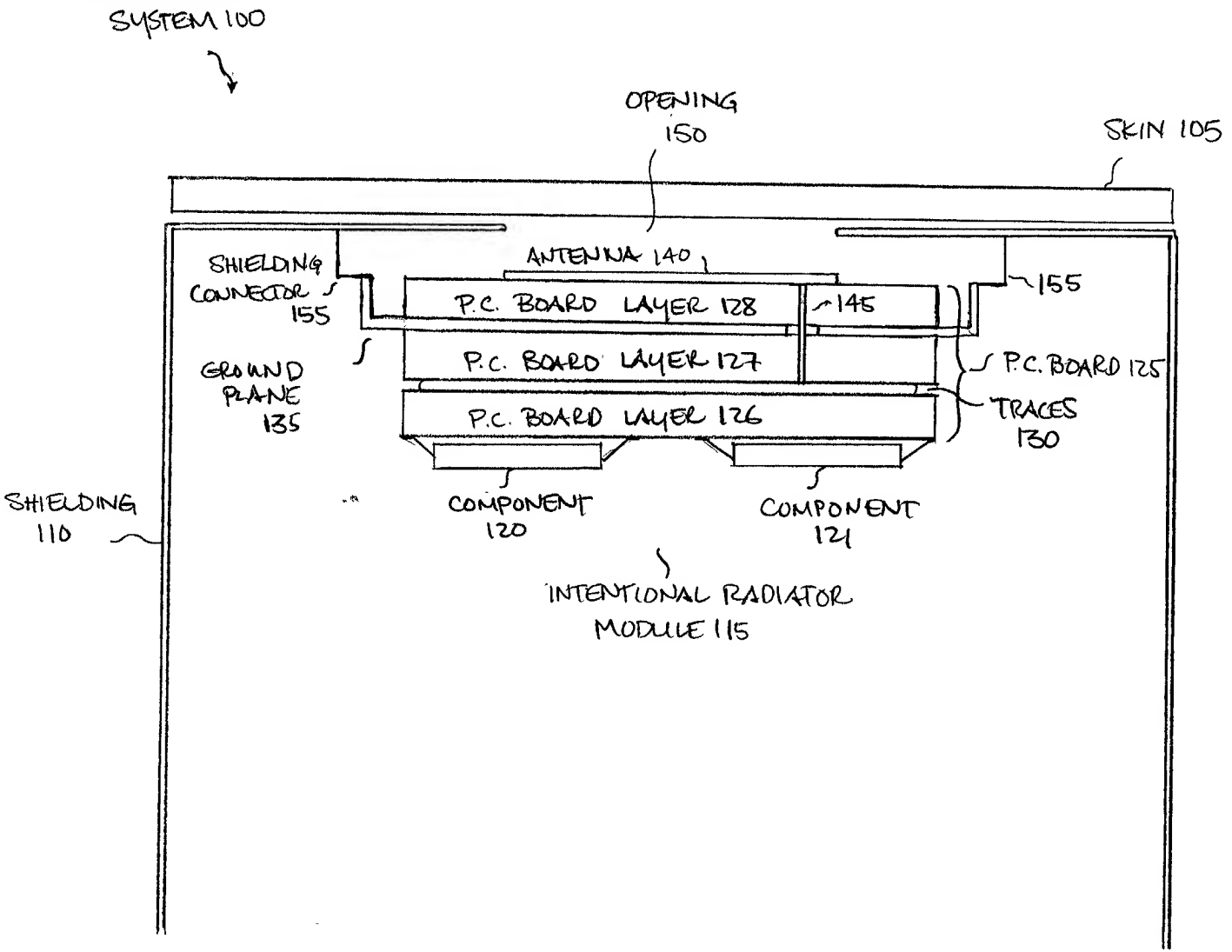

FIGURE 1

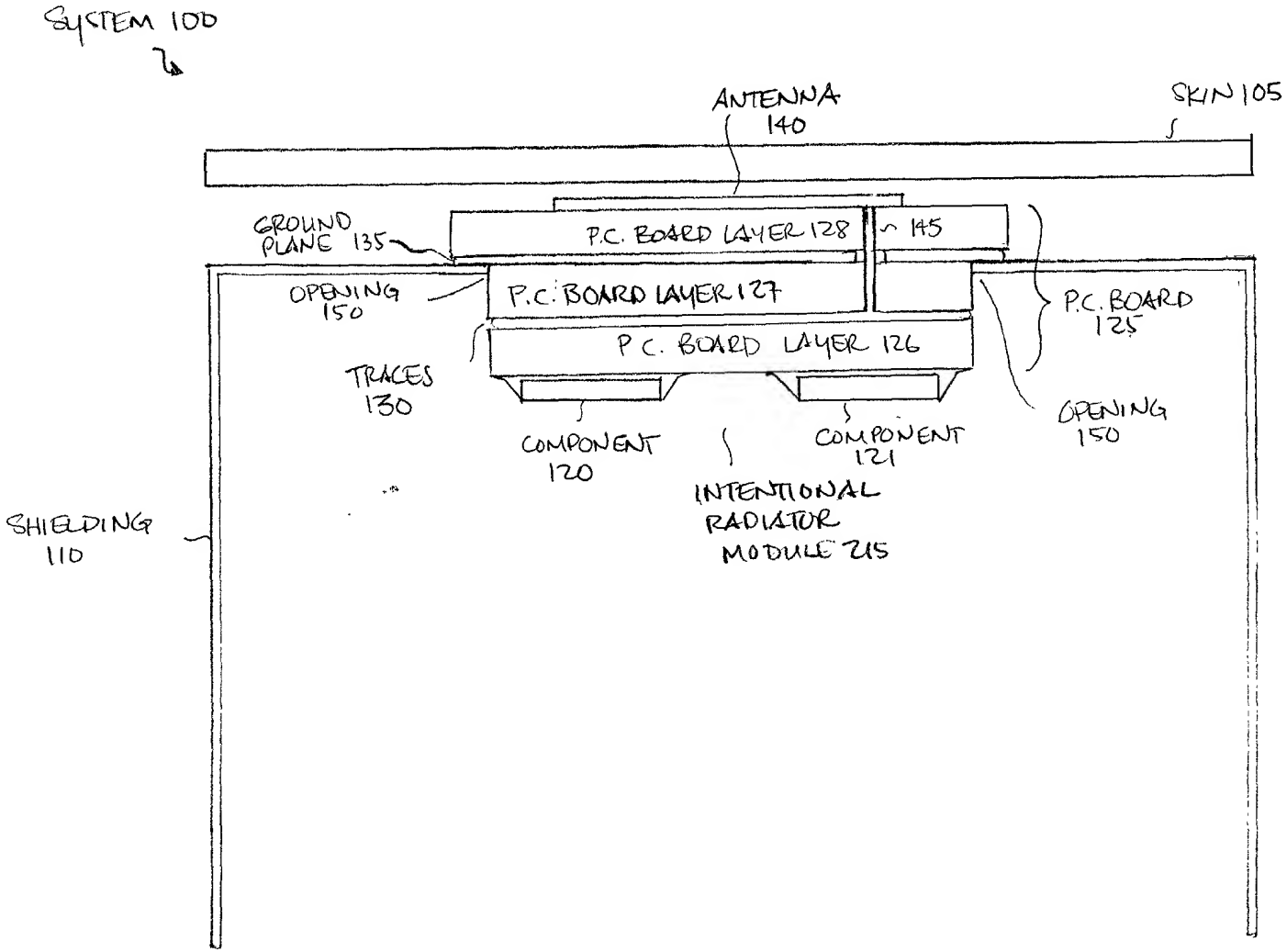

FIGURE 2

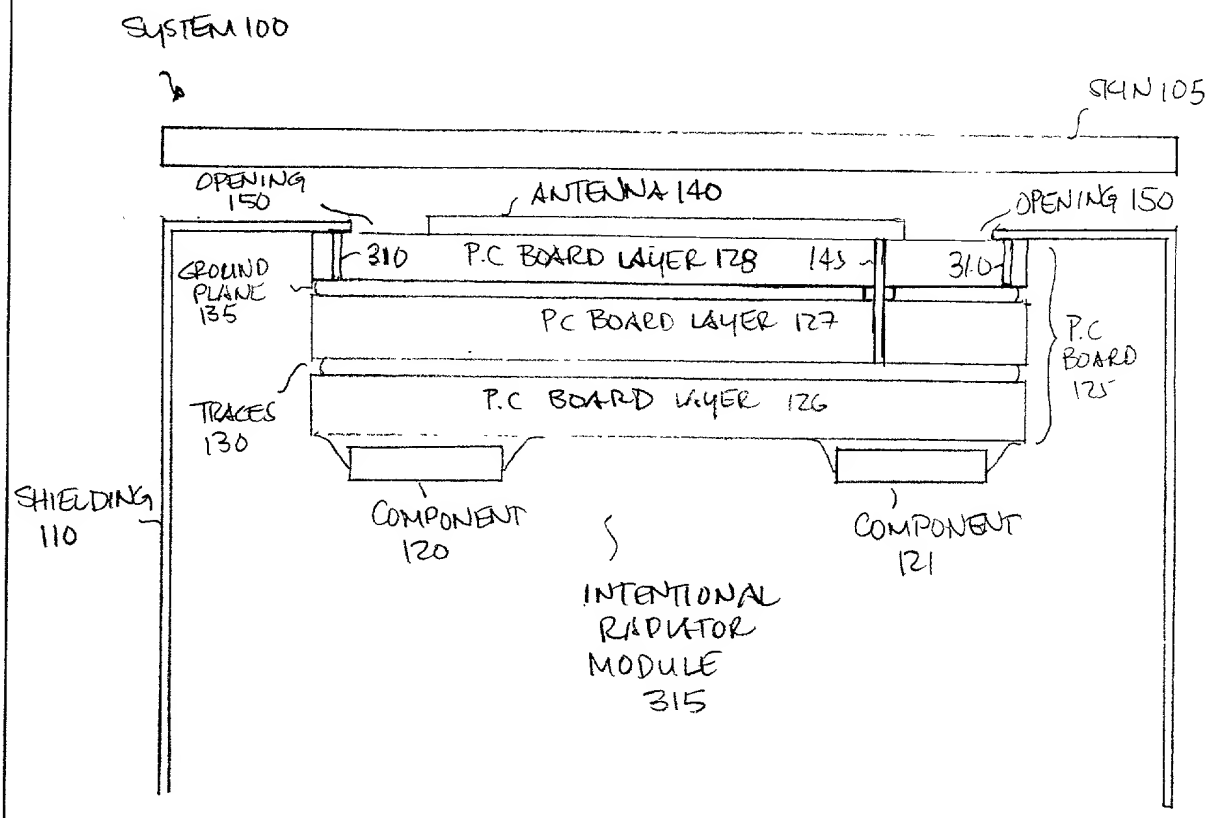

FIGURE 3

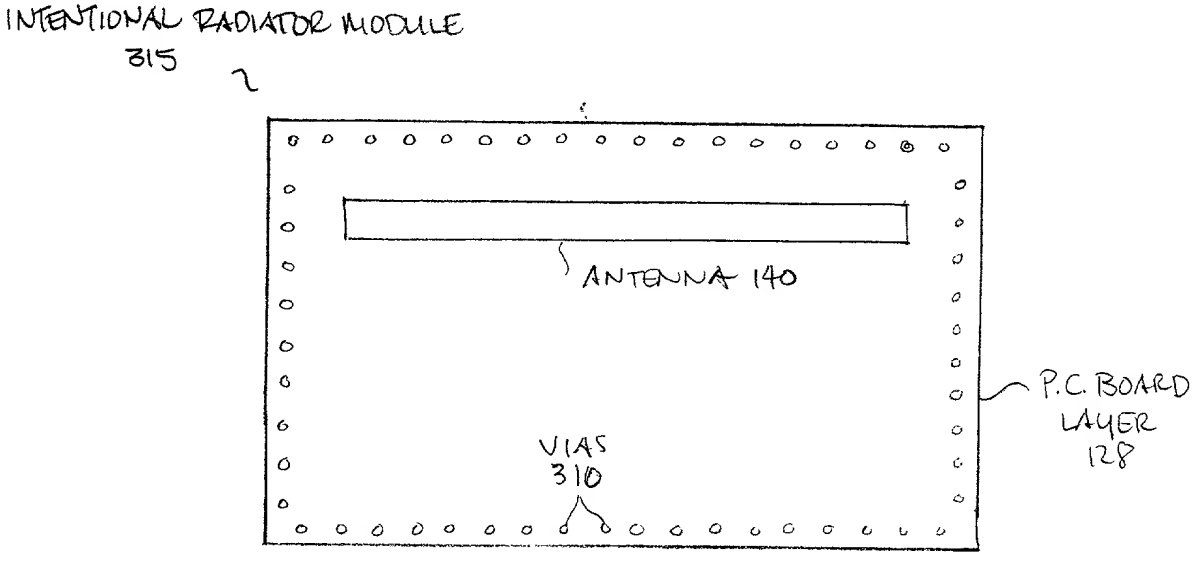

FIGURE 4

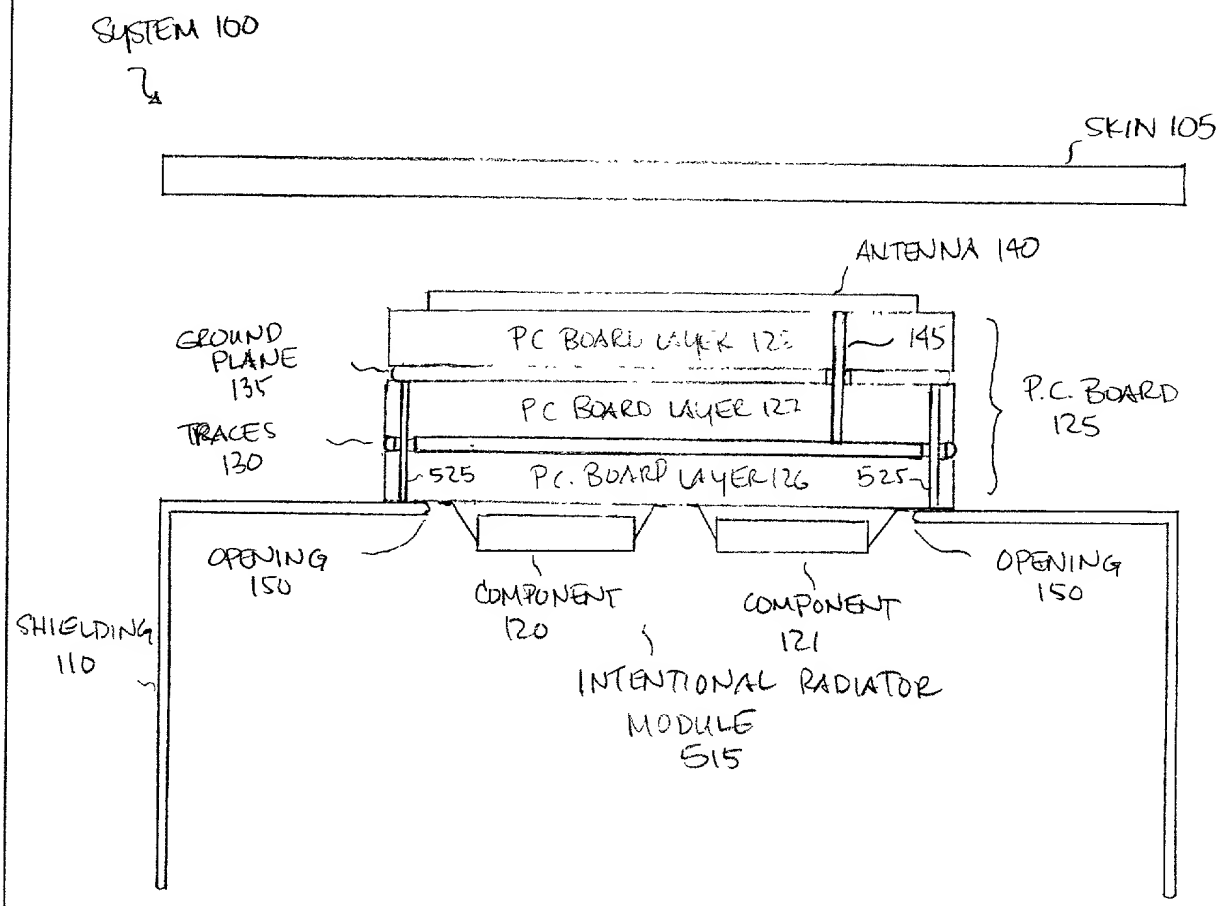

FIGURE 5

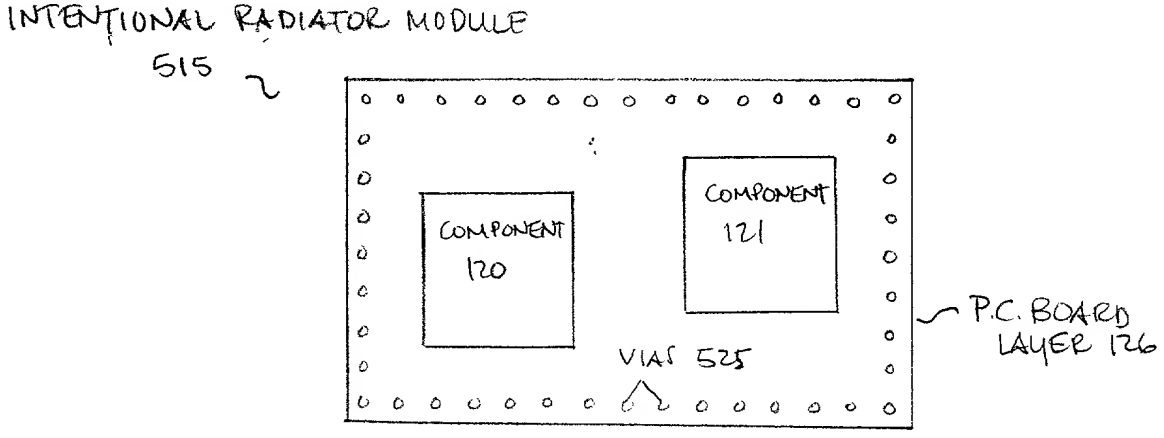

FIGURE 6

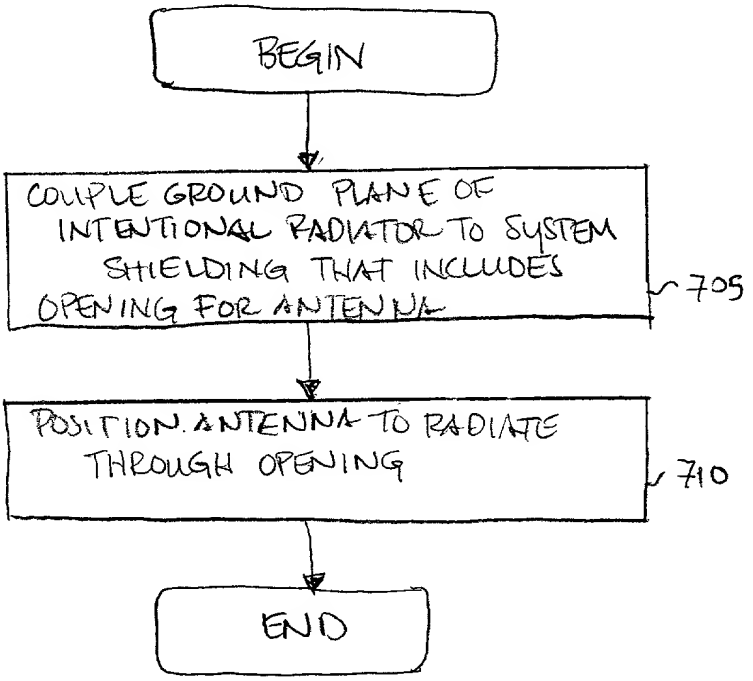
BEGIN
COUPLE GROUND PLANE OF INTENTIONAL RADIATOR TO SYSTEM SHIELDING THAT INCLUDES OPENING FOR ANTENNA
705
POSITION ANTENNA TO RADIATE THROUGH OPENING
710
END

FIGURE 7

Attorney's Docket No.: 42390.P6280 PATENT

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION
(FOR **INTEL CORPORATION** PATENT APPLICATIONS)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

A METHOD AND APPARATUS FOR INTEGRATING AN INTENTIONAL RADIATOR IN A SYSTEM

the specification of which

XX is attached hereto.
___ was filed on _____ as
United States Application Number _____
or PCT International Application Number _____
and was amended on _____.
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Priority Claimed

(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below

(Application Number)	Filing Date
(Application Number)	Filing Date

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Number)	Filing Date	(Status -- patented, pending, abandoned)
(Application Number)	Filing Date	(Status -- patented, pending, abandoned)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Title 37, Code of Federal Regulations, Section 1.56
Duty to Disclose Information Material to Patentability

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclosure information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclosure all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) Prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) The closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made or record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application;

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.